Annual Progress Report on the Neuse Agricultural Rule
(15A NCAC 2B .0238)

A Report to the NC Environmental Management Commission
from the Neuse Basin Oversight Committee

Crop Year 2006

Summary

The Neuse Basin Oversight Committee (BOC) has received and approved annual reports estimating progress for the 2006 crop year from seventeen Local Advisory Committees (LACs) operating under the Neuse Agricultural Rule as part of the Neuse Basin Nutrient Management Strategy. For the entire basin, agriculture has achieved an estimated 45% nitrogen reduction compared to the 1991-1995 baseline. This continues to exceed the rule-mandated 30% reduction. This year reports a two percent decrease in nitrogen loss reduction compared to the 47% nitrogen reduction reported for 2005. The main reason for this decrease is due to crop shift from soybeans to other crops requiring higher nitrogen application rates. This year, all but one of the seventeen LACs have achieved their nitrogen reduction goal established by the BOC. Person County just missed meeting their goal by a mere 0.8%, while seven counties continue to maintain their nitrogen reduction of over 40% reported last year. Nitrogen loss reduction from agricultural land was accomplished through best management practice (BMP) installation, fertilizer application reduction, and cropland attenuation. The BOC will continue to focus their efforts in maintaining the reductions that have been achieved and promoting further implementation of conservation practices.

This annual report includes refinements to baseline values. In June 2007, North Carolina State University (NCSU) scientists released a new version of the Nitrogen Loss Evaluation Worksheet (NLEW) software that incorporates updated nitrogen reduction credit based on buffer width. For this report, the baseline was recalculated using this new version, and 2006 reports were calculated using both NLEW versions 5.02 and 5.30 (Table 1). The revision of NLEW has led to adjustments in both individual LAC and basinwide nitrogen reduction rates.

Rule History and Requirements

In December 1997, the Environmental Management Commission (EMC) adopted the Neuse River Basin Nutrient Sensitive Waters (NSW) Management Strategy. For the first time in state history, mandatory controls were applied not only on point source pollution, but also on nonpoint source pollution in the Neuse River Basin. The strategy has eight rules that affect both urban and rural areas. The strategy is aimed at reducing the average annual load of nitrogen delivered to the Neuse River Estuary from point and nonpoint source pollution by a minimum of 30% of the average annual load from the period 1991 through 1995 by the year 2003.

The Neuse agricultural rule provides each farmer with the option of becoming part of a collective local strategy for implementing BMPs or implementing standard BMPs as specified in the rule. A Basin Oversight Committee and seventeen Local Advisory Committees were established to

implement the Neuse agricultural rule and to assist farmers with complying with the rule.

All seventeen LACs submitted their first annual reports to the BOC in May 2002. All LACs had achieved their nitrogen reduction goal established by the BOC in 2003, and all have continued to meet their goals annually, with the exception of one county this year who did not meet their goal be less than one percent.

Table 1. Estimated Reductions in Agricultural Nitrogen Loss from Baseline (1991-1995) and 2006 in NLEW Versions 5.02 and 5.30, Neuse River Basin

County	NLEW v5.02 Baseline (N Loss in lbs.*)	NLEW v5.30 Baseline (N Loss in lbs.*)	NLEW v5.02 Ann Report 06 (N Loss in lbs.*)	NLEW v5.30 Ann Report 06 (N Loss in lbs.*)	NLEW v5.02 Reduction	NLEW V5.30 Reduction
Carteret	1,590,336	1,274,541	680,196	489,262	57.2%	61.6%
Craven	4,117,771	3,893,265	2,091,753	1,950,016	49.2%	49.9%
Durham	88,274	167,317	56,650	107,892	35.8%	35.5%
Franklin	73,013	149,640	43,121	91,154	40.9%	39.1%
Granville	71,141	156,004	43,719	101,751	38.5%	34.8%
Greene	4,826,509	4,046,251	2,757,172	2,143,007	42.9%	47.0%
Johnston	6,655,186	6,303,200	2,957,655	2,876,242	55.6%	54.4%
Jones	2,887,499	2,898,537	1,527,169	1,567,158	47.1%	45.9%
Lenoir	4,308,849	4,008,721	2,669,710	2,744,966	38.0%	31.5%
Nash	1,127,424	1,115,518	754,801	756,184	33.1%	32.2%
Orange	182,405	436,356	108,951	273,531	40.3%	37.3%
Pamlico	2,740,111	2,393,849	1,726,091	1,460,227	37.0%	39.0%
Person	369,037	534,043	274,679	399,373	25.6%	25.2%
Pitt	3,140,110	3,053,543	1,933,759	1,911,232	38.4%	37.4%
Wake	554,794	1219036	172,740	495,572	68.9%	59.3%
Wayne	8,113,993	7,786,992	4,563,227	4,730,401	43.8%	39.3%
Wilson	2,037,003	2,614,048	876,446	1,183,070	57.0%	54.7%
Collectively for the entire Neuse River Basin	42,883,455	42,050,861	23,237,839	23,281,038	45.8%	44.6%

Current Status

Nitrogen Reduction from Baseline for 2006

All seventeen LACs submitted their fifth annual report to the BOC in September 2007. For the entire basin, agriculture has achieved a 45% nitrogen reduction when using NLEW v5.30 to compare the 2006 crop year to the 1991-1995 baseline. This is a two percent decrease from last year's reported values, largely due to crop shift from soybeans to crops requiring higher nitrogen application rates. This year, all but one of the LACs have achieved their nitrogen loss reduction goal established by the BOC, and Person County just missed meeting their goal by less than one

percent. Table 2 lists each county's baseline, its proposed reduction goal, and nitrogen reduction from baseline in 2005 and 2006.

Changes to NLEW Nitrogen Accounting Tool

The essence of NLEW is an empirically derived spreadsheet model that estimates nitrogen export from agricultural management units through surface water and groundwater partitioning of nitrogen movement. The primary use of NLEW is to estimate relative reduction in nitrogen export through a pre- and post-BMP implementation calculation, rather than estimating delivery to surface waters.

In September 2007, NCSU scientists completed a new version of NLEW. This latest refinement incorporates updated soil series and nitrogen reduction credit based on buffer width. Buffers now generate a percentage nitrogen reduction that is not tied to a specific vegetation type. The revised N reduction credit for buffers ranges from 30% for buffers that are 20 feet wide, to 60% reduction credit for buffers that are 100 feet wide. For this report, the baseline was recalculated using this new version, and 2006 reports were calculated using both NLEW versions 5.02 and 5.30. Table 1 compares results between different versions of NLEW.

Table 2. Estimated Reductions in Agricultural Nitrogen Loss from Baseline (1991-1995) for 2005 (NLEW v5.02) and 2006 (NLEW v5.30), Neuse River Basin

County	Baseline N Loss* in lbs. NLEW v5.30	Proposed Percent Reduction	Percent of N Reduction From Baseline in 2005 NLEW v5.02	2006 N Loss* in lbs. NLEW v5.30	Percent of N Reduction From Baseline in 2006 NLEW v5.30
Carteret	1,274,541	>30%	55.4%	489,262	61.6%
Craven	3,893,265	>30%	61.7%	1,950,016	49.9%
Durham	167,317	>30%	50.2%	107,892	35.5%
Franklin	149640	30%	68.5%	91,154	39.1%
Granville	156,004	21%	40.2%	101,751	34.8%
Greene	4,046,251	30%	41.1%	2,143,007	47.0%
Johnston	6,303,200	30%	62.2%	2,876,242	54.4%
Jones	2,898,537	>30%	45.0%	1,567,158	45.9%
Lenoir	4,008,721	>30%	34.9%	2,744,966	31.5%
Nash	1,115,518	30%	30.0%	756,184	32.2%
Orange	436,356	18%	45.8%	273,531	37.3%
Pamlico	2,393,849	>30%	39.2%	1,460,227	39.0%
Person	534,043	26%	32.8%	399,373	25.2%
Pitt	3,053,543	30%	47.5%	1,911,232	37.4%
Wake	1219036	30%	78.9%	495,572	59.3%
Wayne	7,786,992	30%	35.3%	4,730,401	39.3%
Wilson	2,614,048	>30%	54.2%	1,183,070	54.7%
Collectively for the entire Neuse River Basin	42,050,861		46.6%	23,281,038	44.6%

* Nitrogen loss values are for comparative purposes. They represent fertilizer that was applied to agricultural lands in the basin and neither used by crops nor intercepted by BMPs in a Soil Management Unit, based on NLEW calculations. It may not represent the actual loss from the Soil Management Unit.

As shown in Table 3, nitrogen loss reduction from agricultural land was accomplished through BMP installation, better management of fertilizer, and cropland attenuation. The most significant change this year is due to cropping shift. There was a decrease in the amount of soybean acreage, and a corresponding increase in other major crops requiring higher fertilization rates for crop production. Staff estimates that these factors contributed to the nitrogen loss in the following percent reduction:

Table 3: Nitrogen Reductions from the Baseline (1991-1995) Level on Agricultural Lands, Neuse River Basin

	2005 NLEW v5.02	**2006** NLEW v5.30
BMP Implementation	11%	8%
Fertilization Management	11%	16%
Cropping Shift	8%	5%
Cropland converted to grass/tree	1%	1%
Cropland lost to idle land	11%	10%
Cropland lost to development	5%	5%
Total	47%	45%

BMP Installation

More BMPs have been installed in 2006 due to the increase of financial and technical assistance provided in the 2002 Farm Bill, the additional assistance of the North Carolina Agriculture Cost Share Program (ACSP) and the Conservation Reserve Enhancement Program (CREP). It is estimated that over half of enrolled croplands received treatment from the installed BMPs. BMP installation goals were set by the local nitrogen reduction strategy, which was approved by the EMC in 1999. As shown in Table 4, agriculture has exceeded all of these goals with the exception of nutrient management. There has been a small overall increase in the amount of BMPs receiving nitrogen reduction credits installed in the past year, however the percent reduction from BMP implementation has decreased from 11% in 2005 to 8% in 2006. This decrease can be explained by the change in the reduction credit that is given to buffers in NLEW v5.30. Also of note is that this version of NLEW accounts for additional widths of buffers, so there was some shifting of acres of buffers based on the previously reported widths. Previous years buffer data was not collected by widths greater than 50 feet, so that is why 2006 is the only data under the 70 and 100 feet buffer widths in Table 4. There was not significant decrease of the 50 feet wide buffers in 2006, these buffers were just separated into additional categories to reflect those with wider widths.

Table 4: Agricultural Best Management Practices Receiving Nitrogen Reduction Credits Installed in the Neuse River Basin from 1996 to 2006

BMP Types	BMP Installation Goals (ac)	1996-2005 (ac)	1996-2006 (ac)	2006 Progress (ac)	Goal Exceedence as of 2006 (ac)
20' Buffer	1,370	68,888	70,017	1,129	68,647
30' Buffer	700	10,356	10,442	86	9,742
50' Buffer	2,000	142,665	30,613	-112,052	28,613
70' Buffer	0		11,483	11,483	11,483
100' Buffer	0		109,656	109,656	109,656
Scavenger crop	5,200	38,371	31,209	-7,162	26,009
Nutrient management	280,000	266,342	267,869	1,527	-12,131

Not all types of BMPs provide nitrogen reduction and therefore these additional BMPs do not receive nitrogen reduction credits. However, these types of BMPs, which increased in numbers in 2006, do provide water quality benefits. These BMPs reduce the loss of sediment and other nutrients, such as phosphorus, from agricultural lands to surface water and shallow groundwater. Table 5 lists these types of BMPs installed from 1996 to 2006, which have prevented the erosion of more than 540 thousand tons of soil. Units of BMPs reported in Table 5 are the actual BMP footprint acreage, as opposed to the acreage treated by the BMPs.

Table 5: Agricultural Best Management Practices Not Receiving Nitrogen Reduction Credits Installed in the Neuse River Basin from 1996 to 2006

BMP Types	1996-2004 *	1996-2006 *	Annual Progress
Conservation tillage	72,171 acres	77,719 acres	5,548 acres
Conservation tillage- 3 Years	8,543 acres	8,608 acres	65 acres
Long term no-till	14,508 acres	14,508 acres	0
Terraces	13,657 feet	13,657 feet	0
Diversion	130,901 feet	130,901 feet	0
Sod based rotation	4,057 acres	4,085 acres	30 acres
Strip cropping	44 acres	165 acres	121 acres
Field border	542 footprint acres	610 footprint acres	68 footprint acres
Grassed waterway	2,138 footprint acres	2,183 footprint acres	45 footprint acres
Livestock exclusion	64,298 feet	64,298 feet	0
Streambank stabilization	300 feet	350 feet	50 feet
Critical area planting	0	28 acres	28 acres
Land smoothing	0	129 acres	129 acres

***** Information obtained from NC Agricultural Cost Share Reports 12/1995 through 12/2006. Best management practices that were voluntarily installed through various federal programs or without government assistance are not included.

Fertilizer Management

With greater nutrient management and increased costs of fertilizer, farmers in the Neuse River Basin have reduced their fertilizer application since 1996. Table 6 indicates that fertilization rates for most major crops in the basin have been reduced from the baseline period. The fertilization rates for cotton, wheat and tobacco in 2006 remained constant with the application rates reported in 2005.

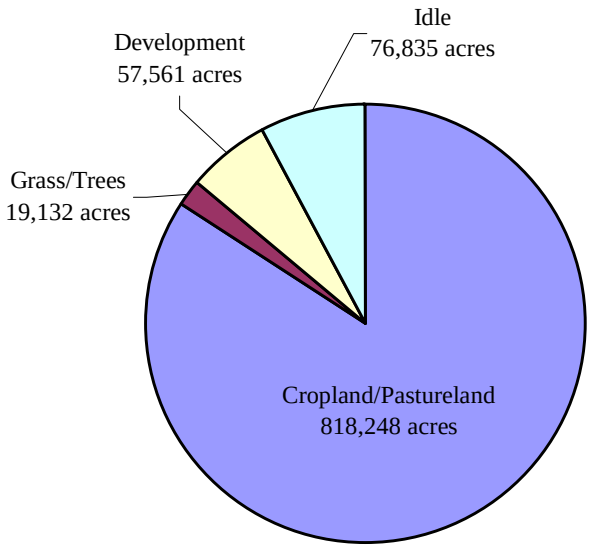
Table 6. Average Fertilization Rate for Major Agricultural Crops in the Neuse River Basin in 2005 and 2006 Compared to the Baseline Period (1991-1995)

Crop	Baseline Average Fertilization Rate (pounds/acre)	2005 Average Fertilization Rate (pounds/acre)	2006 Average Fertilization Rate (pounds/acre)
Corn for grain	160	128	132
Soybeans	19	0.7	0.8
Cotton	84	74	74
Wheat	112	108	108
Tobacco	87	74	75

Cropland Loss and Cropping Shift

Total acres of cropland in the Neuse River Basin fluctuate every year. Each year, some cropland is permanently lost to development or converted to grass or forest land. The Neuse River Basin has experienced significant population growth since the 1980s. Durham, Johnston, and Wake Counties are growing the fastest in the upper basin, with Pitt County growing fastest in the lower basin. In the previous report for 2005, 50,060 acres of land were reported being lost to development since the baseline period. As shown in Figure 1, approximately 7,501 more acres of the cropland in the basin have been lost to development in 2006. Cropland loss has contributed significant nitrogen reductions for many counties throughout the basin. However, some croplands are also temporarily taken out of agricultural production each year. Those changes are reported in the idle land category.

Figure 1. Loss of Agricultural Land to other Land Uses Between the Baseline Period (1991-1995) to 2006, Neuse River Basin

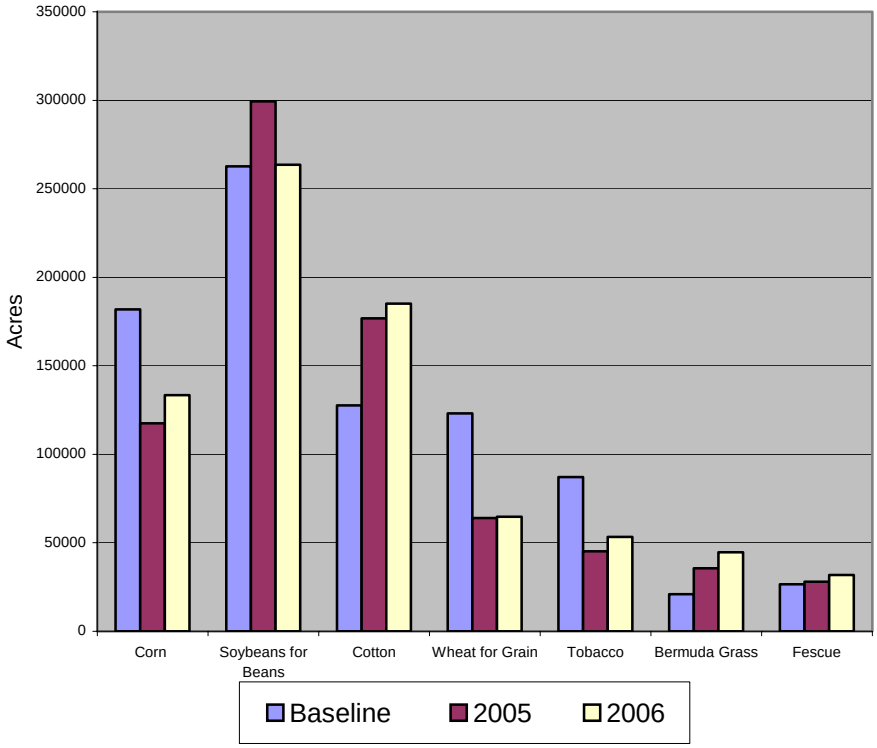


The Basin Oversight Committee recognizes the dynamic nature of agricultural business and science resulting from a variety of factors including:

- Changes in world economies or trade policies
- Changes in government programs (i.e., commodity support or environmental regulations)
- Weather (i.e., long periods of drought or rain)
- Scientific advances in agronomics (i.e., production of new types of crops or improvements in crop sustainment)
- Plant disease or pest problems (i.e, viruses or foreign pests)
- Farm location (i.e., large grain grower renting local farms moves to cash crop as rental lands sold to development)
- Age of farmer (i.e., as retirement approaches farmers may move from row crops to cattle)

Figure 2 shows changes of crop pattern in the Neuse River Basin for the baseline period (1991-1995) as compared to 2005 and 2006. It depicts that in 2006 there were increases in acres of corn, cotton, tobacco, bermuda grass and fescue. The figure also shows that in 2006 there was a significant decrease in acres of soybeans. The wheat acreage remained fairly constant over the past two years. The most notable factor is the decrease in soybean acreage in 2006, and increase in crops that require higher nitrogen application rates than soybeans. This shift likely lead to the 3% decrease in nitrogen loss reduction.

Figure 2: Changes in Agricultural Crop Pattern in the Neuse River: Baseline Period (1991-1995), 2005, and 2006



While corn acreage did increase in 2006, and similar results are expected in 2007, it is important to note that nitrogen application rates for corn have dropped significantly relative to the baseline period. This decrease in fertilization rate is due to the intensive nutrient management education efforts conducted in the basin and to the increasing cost of nitrogen.

Agriculture in the Neuse River Basin will continue to change over the next decade. Historical farming practices in North Carolina cannot be used as a reliable predictor for the future agricultural picture in the state. Tobacco and peanut program changes have occurred that will likely result in major changes for many farms in the Neuse River Basin. Conversion of cropped lands to other agricultural and non-agricultural uses also remains a likely scenario in many Neuse River Basin counties. New crops are likely to be grown in the basin as a result of bioenergy and biopharmaceutical production, and this will shape the future of agriculture in the basin.

The Local Advisory Committees have been advised of the need to monitor changes in agriculture for the county and to update strategies to accommodate these changes. The LACs will review and encourage additional BMPs based on changes in crops grown, crop management, BMP management or other factors. In addition, individual farm plans must be updated as any changes occur that will result in changes in nitrogen use on farmlands.

Future Steps

The Neuse Agricultural Basin Oversight Committee will continue to work with Local Advisory Committees and farmers to reduce nitrogen loss from agricultural lands in the Neuse River Basin. The BOC continues to encourage counties to implement additional BMPs to further reduce nitrogen loss.

Despite significant nitrogen reduction progress observed near the Neuse estuary, the 30% nitrogen reduction target established by the General Assembly has not yet been reached. Nitrogen reduction values presented in this annual summary reflect “edge of field” calculations, which contribute to the overall 30% goal. Significant quantities of agricultural BMPs have been installed since the adoption and implementation of the nutrient management strategy. However, the measurable effects of these BMPs on overall instream nitrogen reduction may take years to develop due to the nature of nonpoint source pollution. In the summer of 2005, the Division of Water Quality concluded data collection for the next Neuse River Basinwide Water Quality Plan. The Basin Oversight Committee, the Division of Soil and Water Conservation and the local Soil and Water Conservation Districts will assist the Division of Water Quality as they complete the Neuse River Basinwide Water Quality Plan over the coming months.